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(For the EUSO Collaboration)

Abstract

The focal surface of the EUSO (Extreme Universe Space Observatory) telescope will consist of 5500 multi-anode photomultipliers (MAPMT). The total number of pixels amounts to 2.10^5 pixels.

The EUSO electronics including both analog and digital front end electronics will be able to cover a dynamic range of 4 order of magnitude, from a fraction of photoelectron to about 4000 photoelectrons. In the AFEE full version, the anode pixel channel can accept up to 400 photoelectrons per μs and the dynode channel up to 3750 photoelectrons per μs. The gains of MAPMTs and of the electronics can be calibrated with single photoelectron spectra while the shutter is closed. Dedicated on board light sources with ajustable and controlled intensities will be used to illuminate the internal faces of the shutter covered with diffusing reflectors.

Relativistic cosmic upward going protons crossing the glass and the filter of the MAPMTs may also provide physical calibration events. To detect such events, there is possibility in the AFEE design to have at the pixel level a second discriminator with a threshold at around 10 photoelectrons. A rate of about 10 counts per hour per pixel with a signal up to few 10 of photoelectrons is expected. They may be used for gain stability control or calibration. These measurements will be done also while the shutter is closed and will not reduce the duty cycle. Due to the large number of pixels, a procedure for in flight calibration of photon detectors and front end electonics has to be optimized to reduce time and memory consumption. Besides, the mean photon background viewed by the telescope can be evaluated from the measurement of the 5500 dynode signal integrals. The photon background survey will provide guidance for the ajustement the trigger thresholds.

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